

WIND, WAVE, AND SWELL ON THE NORTH ATLANTIC OCEAN¹

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During a voyage from Southampton to Trinidad and back by R. M. S. *Oruba* the period of the waves was taken several times daily, and from this their speed was calculated. The speed of the wind was ascertained by means of a Robinson anemometer (lent by the Meteorological Office), due allowance being made for the speed of the ship and the direction of the wind.

The water is very deep from a short distance beyond Ushant, and free from strong currents so far as Barbados. The speed of the wind ranged from 13.9 to 23.6 statute miles per hour. That of the waves was in all cases less, the difference ranging from 1.0 mile an hour to a little more than 8.0 miles an hour. The latter is sufficient to keep a light flag flying. Anything less than 1 mile an hour is reckoned a calm. The difference was not proportional to the speed of the wind; nevertheless a relationship emerges when account is taken of the observations which were made simultaneously of the swell of the sea. When swell and wave ran precisely in the same direction (as sometimes occurred in the region of the trade winds) and on one day when no swell was recorded, the speed of the wave was so nearly equal to that of the wind that the breeze blowing over the ridges was only equal to the "light air" which barely suffices to give steerage way to a fishing smack. Such a light air would be detected on land by drift of smoke but would not move a wind vane. Thus there was no longer a battle between wind and wave.

When the swell followed but crossed the wave the difference in speed of wind and wave was greater, and this difference increased rapidly when the crossing swell was meeting, instead of following, the wave. When the waves were much slower than the wind their height was always small, and sometimes their fronts were short and irregular. It was evident that the growth of waves in both length and height was much hindered by a crossing swell, and it can be safely inferred that the general absence of swell is a sufficient reason for the rapid rise of waves upon inclosed seas. When a wind comes on to blow in the direction of the ocean swell with a speed greater than that of the swell, the growth of large, steep waves is very rapid (doubtless even more rapid than their growth from smooth water), but this occurrence is relatively rare in the North Atlantic.

The direction of the breaker out at sea was found to be intermediate between that of wave and swell (the breaker being formed when they override), so that the practice of observing the direction of "the curl on the water" as a method of determining the direction of the wind gives an erroneous result whenever there is a crossing swell, which is the usual condition upon the oceans. The general run of the waves, on the contrary, gives a trustworthy indication of the direction of the wind.

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BAROGRAM ANALYSIS IN WEATHER FORECASTING

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The Italian meteorologist, Francesco Vercelli, has made a laborious study of barographic records from various parts of the world, and various periods and seasons, submitting these curves to a process of periodigram analysis on the lines familiar in tidal investigations, or as applied to the study of seiches in lakes by the late Professor Chrystal. The results are described in full

detail in a booklet published last year in Rome, under the auspices of the Geophysical Institute of Trieste, entitled "Nuovi esperimenti di previsioni meteorologiche."

From the generalized point of view, the barometric curves are shown to contain the well-known diurnal period which is so outstanding in the Tropics, various periods ranging between a few days and a month, and an annual period, together with a small "insoluble residue," representing what must be regarded as irregular fluctuations. The amplitudes of these several periods, and other characteristics thereof, differ greatly according to the latitude, season, and continentality. If the periodical composition of a given barogram is known, it becomes possible to synthesize its prolongation on the assumption that none of the contained periods die out or others reappear, and thus to make a forecast of the course of barometric pressure for a longer period than is possible by the ordinary synoptic chart method.

Vercelli claims—and the responsibility for the statement must rest with him—to have obtained remarkably good agreement between the predicted and actual continuations of his curves, and to have used this method of weather forecasting with much success in circumstances of grave responsibility on the Italian front during the War. He indicates the main source of error to be the liability to cessation, or temporary suspension, of any of the component periods, or the reappearance of others. He also points out that the paper in question, discussing the analysis of single curves, is only the commencement of the subject, since the next step will consist in coordinating the analyses of curves from several places; this would greatly enhance the usefulness of this method of forecasting.

The author does not, however, appear to lay enough stress on the fact that forecasting pressure is by no means equivalent to forecasting weather, and that the correlation between rainfall and the height of the barometer at a place, or even the connection between rainfall and pressure distribution over an area, is none too close from a forecaster's point of view. One has also to consider the tendency of the weather to get into dry or wet "grooves"; for it is well known that during pronouncedly wet spells, downpours occur in passing barometric configurations that would scarcely yield a drop during a dry spell. Moreover, it does not follow that Vercelli's method, even if found practicable in Italy, would answer in England, where it is possible that the relationship between pressure and weather may be rather more complex. It is just such climatic peculiarities we want to discover, and it not too much to say that even if a universal application of Vercelli's system to weather forecasting proved wholly unserviceable, which is scarcely likely, it could not fail to bring to light any such interesting climatological differences between one region and another.—*L. C. W. Bonacina.*

"WHY THE WEATHER"

Most, if not all, REVIEW readers are familiar with the series of *Science Service* notes on "Why the Weather" that have been running in newspapers of the United States and Canada for about a year and a half.

¹ Substance of a paper by Dr. Vaughan Cornish read before Section E (Geography) of the British Association at Toronto on Aug. 8.

² Brooks, Charles Franklin, *Why the Weather*. Harcourt, Brace & Co., New York, 1924.

The author of the notes, Dr. C. F. Brooks, is Associate Professor of Meteorology and Climatology in Clark University. Associated with him in the preparation of the material were John Nelson and Eleanor Stabler Brooks. Each note presents in nontechnical language a summary averaging 250 to 300 words in length of what is known or inferred of the various subjects treated. The first note discussed the topic "Dust is all important" and the four hundred and sixty-seventh, which happens to be the last one available to the reviewer, bears the title "The lakes as storm magnets."

In the volume under review the author has brought together in logical sequence, beginning with the spring season, the essential facts of the weather of that season and their explanation as they appear from the viewpoint of a close student and observer of the weather. Doctor Brooks is known to be one of our keenest ob-

servers of weather phenomena. Although the book treats of many phases of the weather, the facts presented are woven into a connected story and the interest of the reader is sustained throughout.—A. J. H.

LOSS OF FORTY-SEVEN HEAD OF CATTLE BY A SINGLE LIGHTNING BOLT

The Hancock (Minn.) Record of August 8, 1924, contains an account of the killing of 47 head of cattle during a thunderstorm (without rain). The cattle had crowded together under the branches of a large spreading willow tree. The tree and the cattle under it were struck by lightning and the latter dropped in their tracks. Bodily contact seems to have provided the means of conveying the charge to the animals.—Reported by Junior Meteorologist William E. Maughan.

BIBLIOGRAPHY

C. FITZHUGH TALMAN, Meteorologist in Charge of Library

RECENT ADDITIONS

The following have been selected from among the titles of books recently received as representing those most likely to be useful to Weather Bureau officials in their meteorological work and studies.

Ångström, Anders.

Preliminär undersökning rörande temperaturförhållanden över torr och sank mark. [Stockholm. 1924.] 7 p. illus. 20½ cm. (Repr.: Teknisk tidskrift 1924, häft 4. Våg-och vattenbyggnadskonst 1.)

Studier av Sveriges strålningsklimat. [Stockholm. 1924.] 23 p. illus. 23½ cm. (Ymer, Tidskrift utgiven av Svenska sällskapet för antropologi och geografi. Årg. 1924, H. 1.)

Studies of the frost problem. no. 3. [Stockholm. 1923.] p. 401-412. figs. 25 cm. (Geografiska annaler. H. 4, 1923.)

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Hythergraph: an instrument for recording humidity and temperature. Some of the local winds of the western coast of North America. Notes on the irregularities of ocean currents. p. 75-102. illus. 25½ cm. (Bulletin Southern California acad. sci., v. 20, no. 3, May-June, 1924.)

Weather methods. Illustrated reprints. n. p. n. d. v. p. illus. 27½ cm.

Davis, John King.

Willis Island, a storm warning station in the Coral sea ... With an introductory chapter by Griffith Taylor. Melbourne. 1923. 119 p. illus. plates. 22 cm.

Defant, Albert.

Die Windverhältnisse im Gebiete der ehemaligen Österr.-Ungar. Monarchie. Wien. 1924. 14 p. fig. plates. 30½ cm. (Anhang zum Jahrbuche der Zentral-Anstalt für Meteorologie und Geodynamik, Wien. Jahrg. 1920, neue Folge, 57. Bd.)

Diaz, Severo.

El primer año de previsión del tiempo en Guadalajara. pt. 1-2. Guadalajara. 1922-24. 2 pts. 28 cm.

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Mållarens isförhållanden vintrarna 1917/18-1921/22. Stockholm. 1924. 19 p. illus. plates. 31½ cm. (Meddelanden från statens meteorologisk-hydrografiska anstalt. Bd. 2, No. 2.)

Farr, C. Coleridge.

Report on Samoan observatory. Wellington. 1924. p. 318-327. 25 cm. (New Zealand journ. sci. & tech., v. 6, nos. 5-6, 1924.)

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Weather vanes. Chicago. n. d. 16 p. illus. 23 cm.

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Herdman, William Abbott.

Founders of oceanography and their work; an introduction to the science of the sea. New York. 1923. xii, 340 p. front. illus. plates. 22½ cm.

Hill, Leonard Brskine.

Sunshine and open air, their influence on health, with special reference to the Alpine climate. London. 1924. vii, 132 p. plates. diagrs. (1 fold.) 22½ cm.

Home insurance co.

Rate manual. Rain insurance. General rules. [New York. 1924.] 18 p. 20½ cm.

International geodetic and geophysical union. Section of meteorology.

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Letzmann, Johannes.

Das Bewegungsfeld im Fuss einer fortschreitenden Wind- oder Wasserhose. Dorpat. 1923. 136 p. figs. 22½ cm.

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Summary university meteorological records. 1895-1923. [Nanking.] 1924. unp. 22 cm. (Univ. Nanking. Agric. & forestry series. v. 1. no. 8.)

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